

Remarks/Arguments:

By this Amendment, Applicants have amended claim 78. Claims 78-80 and 82-85 are pending.

Claim Rejections Under Section 103

Claims 78-80 and 82-85 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yamamoto in view of Rakuljic. By this Amendment, Applicants respectfully traverse the Section 103(a) rejection.

Claim 78 is an independent claim to which claims 79, 80, and 82-85 depend, either directly or indirectly.

Claim 78 is directed to a laser light source and includes the following elements:

- a distributed feedback type semiconductor laser for emitting laser light,
- a semiconductor laser amplifier for amplifying the laser light, and
- an optical wavelength conversion element for receiving the amplified laser light so as to generate a harmonic wave, the optical wavelength conversion element having periodic domain inverted structures,
- wherein the distributed feedback type semiconductor laser is wavelength-locked, and
- **wherein an RF superimposition is performed for the distributed feedback semiconductor laser.**

It is Applicants' position that the laser light source defined by claim 1 is patentably distinguished from the Yamamoto and Rakuljic Patents at least based on the feature of an RF superimposition being performed for the distributed feedback type semiconductor laser (generally referred to hereinafter as the "Superimposition Feature" of Applicants' claimed

invention). In other words, the references of record simply do not teach or suggest the Superimposition Feature of Applicants' claimed invention.

The amendment to claim 78 of adding the Superimposition Feature is not the addition of new matter but is based on the application as originally filed. In this connection, for example, Applicants point to example 6 of the subject application which is shown in Figure 22 and Figure 18. Moreover, it is stated in the specification at page 52, lines 1-3 (for example) that "Next, an RF superimposition (radio frequency superimposition) was performed for this DBR semiconductor laser." In particular, the distributed feedback type semiconductor laser (DBR) is shown as laser 20a in Figure 22. Thus, there is support for the Superimposition Feature in the originally filed specification.

In addition, the Superimposition Feature is associated with and results in an advantage neither appreciated nor anticipated by the references of record. This advantage is discussed in the originally filed specification at page 52, lines 1-14 which reads as follows:

Next, an RF superimposition (radio frequency superimposition) was performed for this DBR semiconductor laser. A pulse train was optically output from the semiconductor laser by applying a sine-shaped electric waveform of 800 MHz to the DBR semiconductor and utilizing the relaxation oscillation. When the RF superimposition is thus performed for the DBR semiconductor laser, the peak output of the fundamental wave is considerably improved while keeping the oscillation wavelength constant. For a fundamental wave with an average output of 10 W, a harmonic wave of 5 W was obtained with a conversion efficiency of 50%. The conversion efficiency was improved by 5-fold compared to the case when the RF superimposition was not performed. (Emphasis added).

The Yamamoto Patent in general relates to an optical harmonic generating device with reverse polarization layers which are made of non-linear optical crystal polarized in a lower direction and are periodically arranged at regular intervals. Also provided is a non-reverse polarization layer which is made of the non-linear optical crystal polarized in the upper direction and is arranged to surround the reverse polarization layers, and a waveguide penetrating through alternate rows of the reverse and non-reverse polarization layers, along with a first electrode arranged on the waveguide. In addition, a second electrode is arranged on both ends of the alternative rows. An electric field is induced between the first and second electrodes through the waveguide to change a refractive index of the reverse and non-reverse polarization layers. A part of the fundamental wave passes through the alternate rows to be converted to

the harmonic wave, and another part of the fundamental wave passes through the non-reverse polarization layer positioned under the reverse polarization layers to change the refractive index of the fundamental wave.

The Office Action at page 3 readily admits that the Yamamoto Patent does not teach a semiconductor laser to be the distributed feedback type (DFB), or that the output of the laser is to be amplified by a solid-state source or wavelength locked. But it is Applicants' contention that the Yamamoto Patent also lacks any teaching or suggestion of the Superimposition Feature of Applicants' claimed invention. This deficiency of the Yamamoto Patent is not rectified by the Rakuljic Patent.

The Rakuljic Patent in general relates to a laser which utilizes feedback from a volume holographic grating used as a wavelength standard to lock the laser output wavelength to its desired value. This feedback can be non-optical, wherein the holographic filter output is used to actively control the wavelength through an external control mechanism. In addition, this feedback can be optical, wherein a volume hologram reflection grating is used to generate optical feedback into laser gain.

Applicants note that the Rakuljic Patent with respect to the wavelength stabilized laser system shown in Figure 4 states that "[i]n the example in Figure 4, the laser 21 is modulated by a high speed analog RF or digital signal 23 through a current driver 24, and its output is directed into an optical fiber pigtail 25." See col. 9, lines 6-9 of the Rakuljic Patent. But the Rakuljic Patent does not teach that a sine-shaped electric waveform of 800 MHz is applied to the DBR semiconductor and that the relaxation oscillation is used to optically output a pulse train from the semiconductor laser as described above with respect to the advantages of the Superimposition Feature of Applicants' claimed invention. In addition, the Rakuljic Patent does not teach or suggest the Superimposition Feature of Applicants' claimed invention, nor the associated advantage that "[w]hen the RF superimposition is thus performed for the DBR semiconductor laser, the peak output of the fundamental wave is considerably improved while keeping the oscillation wavelength constant." Furthermore, the Rakuljic Patent does not teach the advantage that, for a fundamental wave with an average output of 10 W, a harmonic wave of 5W would be obtained with a conversion efficiency of 50%, or that the conversion efficiency would be improved by 5-fold as compared to the case when the RF superimposition is not

performed. Thus the advantages associated with the Superimposition Feature, as well as the feature itself, is neither taught nor suggested nor appreciated in the Rakuljic Patent.

Furthermore, from the above noted disclosure in the Rakuljic Patent, modulation by a high speed analog RF and modulation by a digital signal 23 through the current driver 24 seem to have no apparent advantage with respect to each other, according to the disclosure "modulated by a high speed analog RF or digital signal 23 through a current driver 24." (Emphasis added). See, col. 9, lines 6-9 of the Rakuljic Patent. Thus the above noted quote from the Rakuljic Patent further supports Applicants' position of any lack of teaching or suggestion of the Superimposition Feature of Applicants' claimed invention.

In conclusion, it is Applicants' contention that neither the Yamamoto Patent nor the Rakuljic Patent discloses the feature of performing an RF superimposition for the DBR semiconductor laser and the advantages associated therewith; namely, an improvement of the conversion efficiency over the case when RF superimposition is not performed.

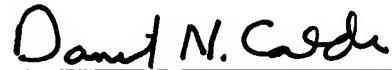
In view of the foregoing remarks and amendment, Applicants respectfully submit that claim 78 as well as dependent claims 79, 80 and 82-85 are patentably distinguished over the Yamamoto and Rakuljic Patents. Applicants therefore request that the Section 103 rejection be withdrawn.

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Claims 78-80 and 82-85 are in condition for allowance. Reconsideration and allowance of all pending claims are respectfully requested.

Respectfully submitted,



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DNC/ds

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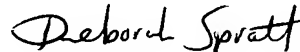
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